Nov. 28, 1950 F. L. GOLDSBY ET AL 2,531,424

SEAL FOR FLOATING ROOF TANKS

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Fig. 1.

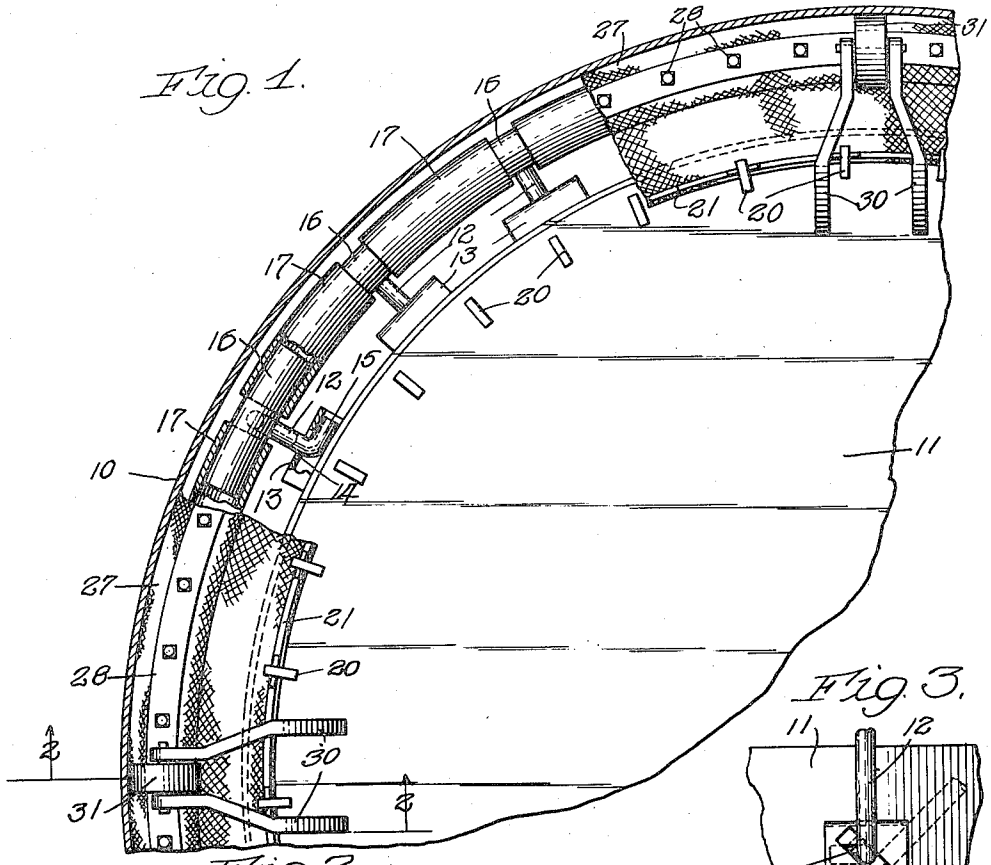


Fig. 3.

Fig. 2.

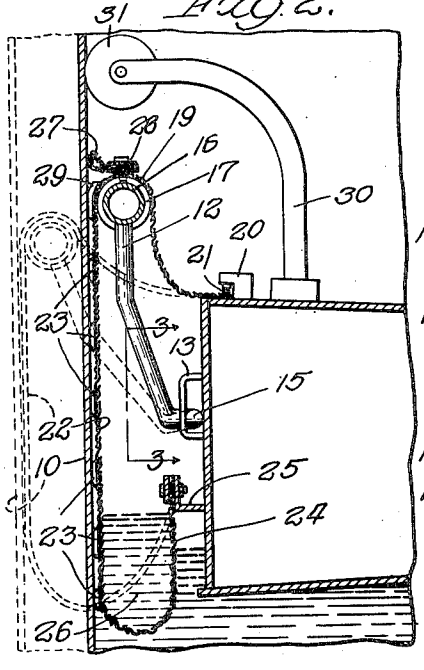
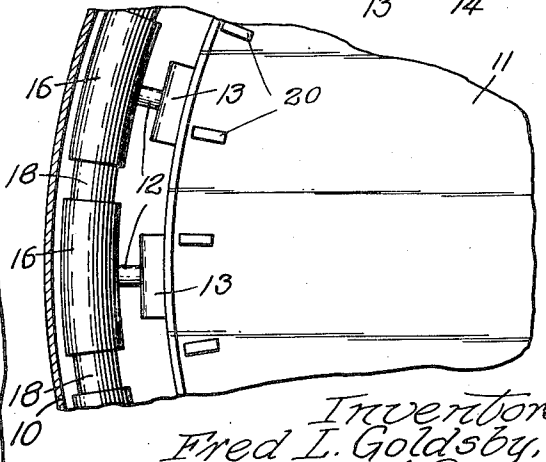


Fig. 4.



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SEAL FOR FLOATING ROOF TANKS

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6 Claims. (Cl. 220—26)

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This invention relates to a floating roof tank, and particularly to a seal for sealing the area between the floating roof and the shell of the tank.

Floating roof tanks are used to store volatile liquids. The roof floats on top of the stored liquid and rises and falls as the quantity of liquid is increased and decreased. This serves to limit evaporation losses of the liquid, as there is very small vapor space provided.

It is necessary in floating roof tanks that means be provided for sealing the area between the edge of the roof and the shell of the tank in order to prevent substantial evaporation losses and to prevent contamination of the stored liquid. We have invented an improved type seal which positively seals this area and provides a substantially gas tight cover for the surface of the stored liquid.

The invention will be described as related to the embodiments shown in the accompanying drawings. Of the drawings Fig. 1 is the fragmentary plan view of a storage tank embodying the invention; Fig. 2 is a vertical section taken along line 2—2 of Fig. 1; Fig. 3 is a vertical section taken along line 3—3 of Fig. 2; and Fig. 4 is a fragmentary plan view similar to Fig. 1 showing an alternate embodiment of the hanger means supporting the sealing member.

In the embodiments of the invention shown in the drawings the storage tank comprises a shell 10 and a floating roof 11. Around the edge of the floating roof and extending toward the shell, there are provided upstanding hanger arms 12 at spaced intervals. Each hanger arm is rotatably attached to the vertical edge portion of the floating roof by means of flat plates 13 attached to the roof and spaced therefrom. These plates have sloping slots 14 (Fig. 3) to hold the ends 15 of the hanger arms 12. These ends are bent substantially at right angles to the main body portion of the hanger arms, and are arranged in this manner so that the hanger arms may rotate outwardly away from the roof. The slots 14 are provided so that the ends 15 of the hanger arms 12 may be easily inserted. If desired the slots may be constructed with a downwardly extending portion at substantially the middle so that the arm will be held at the bottom of the downwardly extending portion.

At the top end of each hanger arm 12 there is located a substantially horizontal pipe 16 attached at its midpoint to the hanger arm. In the embodiment shown in Fig. 1 the pipes are connected to each other by cylindrical sleeves 17 with each end of a sleeve surrounding an end of a pipe 16. In the embodiment shown in Fig. 4 the pipes

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16 are connected by smaller pipes 18 fitted within their ends. The assemblies of pipes 16 and cylindrical sleeves 17 and pipes 16 and smaller pipes 18 form continuous holders around the edge of the roof over which a sealing member 19 may be held. The support is free to expand or contract, and thus adjusts itself to the shape of the shell. Other support means than that shown and described may be used if desired.

The sealing member 19, which is preferably a fabric impregnated with an impervious flexible material, is attached to the edge of the roof by means of, for example, spaced hooks 20 that hold a rod 21 in sealing contact with the edge of the sealing member. The sealing member extends from the edge of the roof up over the support means at the upper ends of hanger arms 12, and down along the edge of the shell 10. The shell portion 22 of the sealing member is provided with raised abrasion-resistant bumper strips 23, while the bottom portion 24 of the sealing member extends upwardly and is fastened to an annular flange 25 at the edge of the floating roof to form a trough 26. This trough is filled with a mobile weighting material such as a non-volatile non-freezing oil of preferably higher specific gravity than the stored liquid. The top surface of the sealing liquid 26 may be above the surface of the stored liquid, or may be level with the stored liquid, but is preferably not below the level of the liquid within the tank. The mobile weighting material may also be a granular material where the granules flow easily over and around each other.

A secondary seal is preferably provided at the topmost portion of the sealing member 19, and this secondary seal may be a fabric attached to the supports by means of bolts 28. Immediately below the secondary seal 27 there is provided a wide bumper strip 29 in contact with the shell 10.

In order to keep the floating roof centered within the shell there are provided pairs of upstanding bracket arms 30 spaced around the edge of the roof with wheels 31 rotatably held at the ends of the bracket arms 30 and in contact with the shell 10.

Although the shell 10 is usually made cylindrical when erected it sometimes gets out of round. The hanger arms 12, being rotatably mounted, will adjust themselves to this out-of-roundness, as shown in dotted lines in Fig. 3.

Having described our invention as related to typical embodiments of the same, it is our intention that the invention be not limited by any of the details of description unless otherwise speci-

fied, but rather be construed broadly within its spirit and scope as set out in the accompanying claims.

We claim:

1. A seal for a floating roof tank comprising a plurality of spaced hanger arms rotatably mounted on the side of the roof extending from the edge portion of the floating roof toward the shell of the tank, an annular carrier means supported by the hanger arms, a flexible impervious sealing member attached to the roof and extending from the edge of the roof over the carrier means, down along the tank shell to a point below the surface of the stored liquid, and up to the roof to form an annular trough at the bottom portion of said sealing member, and a weighting material within said annular trough.

2. The seal of claim 1 wherein the bottom edge of the flexible sealing member is held away from the roof by an annular flange attached to the edge of the roof.

3. A seal for a floating roof tank comprising a plurality of spaced hanger arms extending upwardly from the vertical edge portion of the floating roof toward the shell of the tank, a continuous annular carrier means attached to the outer ends of the hanger arms, a flexible impervious sealing member attached to the edge of the roof above the hanger arms and extending over the carrier means, down along the shell to a point below the surface of the stored liquid, and up to an annular flange attached to the floating roof below the hanger arms to form an annular trough, and a mobile weighting material within said annular trough.

4. The seal of claim 3 wherein a raised bumper strip is provided on the shell side of the sealing member opposite the carrier means and adapted slidably to contact said shell.

5. A seal for a floating roof tank comprising a plurality of spaced hanger arms rotatably mounted on the roof and extending upwardly from the vertical edge portion of the floating roof toward the shell of the tank, a plurality of curved telescoping pipe-like sections arranged in the form of an annulus and attached to the outer ends of the hanger arms, a flexible impervious sealing member attached to the edge of the roof above the hanger arms and extending over the annulus, down along the shell to a point below the surface of the stored liquid and up to an annular flange attached to the floating roof below the hanger arms to form an annular trough, said sealing member having spaced raised bumper strips on the sealing member adapted slidably to contact the shell and including a bumper strip opposite the annulus, and a liquid within said annular trough.

6. The seal of claim 5 including a secondary seal supported by the annulus and adapted to contact said shell above the sealing member.

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